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## A PLEA FOR COMPARATIVE OOLOGY

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PROBABLY there is no natural history pursuit which has had more active and enthusiastic devotees than that which involves the collection of birds' eggs and the study of nidification in general, though too often the latter is looked upon as an altogether secondary consideration. The egg collections in this country—and I am sure the same may be said of Europe and Australia—greatly outnumber the collections of skins, and consequently there are many collectors who are thoroughly familiar with the intricate variations in a large number of birds' eggs and yet are quite uninformed regarding the main anatomical or external characteristics of the birds themselves, excepting, perhaps, the commoner species of their own immediate localities. This has given rise to no little adverse criticism, sometimes thinly veiled, on the part of other investigators, and little as we may relish these admonitions it may as well be admitted frankly that there is much justice in this attitude. Over-specialization in any subject, is bad, and I think that oologists should recognize this principle: he who takes a comprehensive interest in ornithology, and indeed, general zoology, and informs himself accordingly, will be not only much better equipped to pursue his own specialty, but will derive far more profit and enjoyment therefrom. Oology has its appropriate setting in the natural order of things and we cannot afford to ignore this environment.

In conceding so much, however, it may be well to point out that there are certain issues, which, while easily leading to endless contention, are barren of useful results. Thus, the systematist who occupies himself so industriously in the—to him—paramount business of making "sub-species" has little sympathy for the individual who is content to "brood over birds' eggs," as Professor Newton puts it; while on the other hand, the oologist and field collector cannot be expected to wax enthusiastic over what, in his eyes, appears to be simply a fruitless attempt to form academic "characters" out of imperceptible

differences having no objective reality. Whether the work of the systematist or that of the oologist is the more important is not material, after all; their results should be mutually helpful and supplementary and the real value of either must depend upon the ability of the individual and his capacity for accurately ascertaining and interpreting facts.

It has been said of oology that "hardly any branch of the practical study of natural history brings the enquirer so closely in contact with many of its secrets," and probably it is this feature which gives it so wide an appeal. Probably a large majority of oologists find the most fascinating aspect of their pursuit in investigations afield. For many students of nature, and their number is steadily increasing, this is enough, and it behooves us, as collectors, to enquire why we are not content with this phase only; in other words, what is the real purpose behind our laborious collection, preparation and arrangement of the specimens themselves? Doubtless there are various reasons: with certain individuals, happily few in number, let us hope, the formation of an egg collection is, at best, merely a pastime, or perhaps one manifestation of a very general human weakness, namely, acquisitiveness, the desire to obtain simply for the gratification of possessing and, particularly, possessing "more than the other fellow." To others an egg collection may make an esthetic appeal, through the beauty and infinite variety of the specimens, rather than their intrinsic interest. While most of us might confess to a certain sympathetic understanding of this latter point of view it will hardly be contended that the end justifies the means: as has often been pointed out, beads or marbles would do as well.

As a matter of fact, it will be found that nearly all private collections in this country are what might be termed "faunal" collections, the primary object of the collector being, apparently, to obtain the eggs of all birds breeding or otherwise occurring within a certain region, say the United States or some section thereof or, more commonly, North America as a whole. Properly conducted this is doubtless a legitimate aim, but it seems to me that it falls so far short of the real story our cabinets should relate that it ought to be an altogether secondary consideration. From this point of view it is difficult to see how a collection of eggs representing, say, every species of summer resident within the District of Columbia, advances our sum of knowledge one whit beyond an accurate record of the same eggs actually observed *in situ*. It is true that a local collection, of any kind, possesses a certain educational value, for a visual demonstration that such and such birds breed within the District makes a more lasting impression than a mere statement to that effect; but such collections are more appropriate for local schools, museums or other similar institutions.

Is there, then, nothing to justify the oft-repeated claim that oology should be accorded the dignity of a scientific pursuit and that careful study of a collection of eggs may, in itself, afford information obtainable in no other way? Surely there is, provided, however, that the collection is built up on logical principles. Science has been defined as "knowledge gained and verified by exact observation and correct thinking, especially as methodically formulated and arranged in a rational system." Let us note that this does not specify the kind or the quantity of knowledge required, but only how we should obtain and utilize it. Now it is obvious that *some* information may be obtained from a systematic collection of *any* particular class of objects, whether eggs, skins

or teapots; also, that such information should be as complete and accurate as possible. With the information or "knowledge" so available the intelligent collector will proceed to *methodically formulate and arrange it in a rational system*, and when he has done so he is perfectly justified in claiming scientific results, so far as they go. The point too often overlooked is that isolated observations are of little value: they must be correlated.

If we attempt to apply some process of investigation to a "faunal" collection the weakness of the latter becomes at once apparent. To make this clearer let us consider a complete but restricted one like that from the District of Columbia. We will find that it contains two species of falcons' eggs, *F. sparverius* and *F. p. anatum*. The eggs of the Duck Hawk are much larger and darker than those of the Sparrow Hawk, but there is a certain likeness in the type of markings; is this a general characteristic of all falcon's eggs or a peculiarity shared by a few? We must go farther afield to answer this query. I find in my cabinets the eggs of more than a score of falcons: *F. mexicanus* and *phaloena* from California, *fusco-coeruleascens* from Texas, *columbarius* from Assinaboia, *paulus* from Florida, *subbuteo*, *anatum*, *tinnunculus* and *aesalon* from the British Isles, *vespertinus* from Hungary, *eleonorae* from Greece, *sacer* from Russia, *cenchrus* from Asia Minor, *obscurus* from Siberia, and so on through *japonicus* to the distant shores of the Pacific. In latitude there is likewise a wide distribution as shown by *rusticolus* and *gyrfalco* from Lapland and Iceland, *cenchroides*, *unicolor* and others from Australia, and finally, *rupicola* and *rupicoloides* from South Africa. The genus is practically cosmopolitan, the various species nest in almost every possible situation (except under ground), a series of eggs presents a wonderful diversity in color and marking, yet all are distinctly true to one type: each one could be picked out as a falcon's egg and, so far as I am aware, could be mistaken for none other. (Eggs of the Honey Buzzards, *Pernis*, and certain Polyborine species—for example *Milvago chimango*—seem to approach them most closely.)

I think it will be evident that such information is both interesting and desirable, but for its demonstration a collection must be formed along rather definite lines, based on the natural relations of birds rather than on their geographical distribution. Such a "group" collection need not, of course, be universal in scope, but should embrace as many genera, families or orders as the collector's means and opportunities permit, the main point being to make it as complete and accurate as practicable within its natural limitations. Of course a general collection of this sort presents many difficulties and, for most of us, would entail prohibitive expense. Hence, I would by no means advise every collector to lightly go in for exotic material of all sorts—and I speak from many years' experience—nor is this essential. A faunal collection may be amplified in special directions, and this is being done already to some extent. Thus the *Mniotiltidae* have long been favorites with American collectors. In Europe this is more common, and I know one collector who has a marvellous array of eggs of the *Tubinares* and *Lariformes*, and another who specializes in the *Fringillidae* while endeavoring to complete a faunal collection of the British Isles.

But the faunal idea seems to be an obsession with many collectors, and they carry it to the absurd degree of separating entirely their American and "foreign" material. It would be quite as logical to arrange our Bald Eagles' eggs so that those of the Alaskan form are placed in the top drawer, along with

the ducks and auklets, while specimens from Florida would be located at the bottom, congenially surrounded by spoonbills and limpkins! To my way of thinking the oologist who, with a given amount of time (and money) starts out to illustrate all that is ascertainable about the nidification of, say, our North American *Icteridae*, can accomplish far more in the way of scientific results than by attempting to accumulate a "set" of every known form on the A. O. U. List.

While the number of problems open to investigation by the intensive study of a group collection is almost endless, the inviting road towards broad generalizations is far less easy than it seems; for on every hand there is abundant opportunity for false and hasty conclusions which will inevitably carry us far afield. Hence, the systematists are prone to complain that we can afford them little assistance in their labors, as likeness or dissimilarity in birds' eggs cannot generally be relied upon to indicate a corresponding degree of relationship among the birds themselves. Let us cheerfully admit it, proceed to show where the correspondence begins and ceases and then, if possible, ascertain *why*. But in many cases the correspondence is really very close; such examples as those of the owls, tinamous and shore-birds will occur to all, and it is said that the relationship of this last group to the gulls and terns was first pointed out by oologists. Even small groups are sometimes sharply defined, such as the peculiar markings characteristic, I believe, of the genus *Myiarchus*.

On the other hand, the many exceptions, while difficult and confusing, are no less interesting and would doubtless prove equally informing if we held the explanatory key. Thus, eggs of the herons are greenish, while those of the slightly differentiated bitterns may be nearly white or decidedly brown, but are still unspotted. Among their allies, the ibises and spoonbills, however, variation runs riot and we find plain white (e. g., *Ibis molucca*), light greens, dark greens and spotted types in great diversity. Such examples become particularly puzzling when we observe that certain species, even more closely allied, occupying the same restricted habitat, and having identical methods of nidification, may yet produce eggs extremely unlike; as an American example compare the whitish, spotted eggs of *Toxostoma bendirei* with the plain, greenish specimens of its neighbor, *T. crissalis*.

It is particularly in the investigation of such facts that the group collection, of restricted scope, should be of value. Suggestive facts may be forthcoming; thus, if we consider the eggs of the *Mimidae* as a whole we find that while nearly all are commonly spotted, those that are plain (e. g., *T. crissalis*, *G. carolinensis*) seem to always adhere to that type, while in the other forms there is an occasional tendency to lightly marked or unmarked examples. Let us contrast this with an illustration from the genus *Accipiter*; eggs of *fuscus* and *nitus* are, typically, richly marked, those of *cooperi* are commonly plain, while specimens of *cirrhocephalus* (Australian) in my collection are intermediate. But I have one set of *cooperi* (taken by Bingaman) which shows about as much superficial coloring as average specimens of *B. borealis*, while eggs with a few faint spots are not uncommon. Apparently in the genus *Accipiter* either the habit of laying plain eggs has not yet become fixed in any species, as it has with some *Mimidae*, or, more probably, I think, the habit of laying colored eggs has been newly acquired and is not yet universal. We cannot say positively, yet it does seem as if in certain groups we could trace indications of a progressive increase or decrease in egg-pigmentation, which is actually in pro-

cess of development. Though the process is far too slow for direct observation it is probably exceedingly rapid in comparison with most evolutionary changes. Usually, we may assume, such a change would be gradual, but it might in some cases be sudden and discontinuous. This latter condition would seem to be likely when the eggs of some particular species stand forth conspicuously as wholly different from those of all nearly related forms (e. g., *Cistothorus stellaris*).

Great similarity between the eggs of birds distantly related is far less common than dissimilarity among forms that are closely allied. Birds as unlike as parrots and petrels may lay eggs which appear indistinguishable, but this is due to lack of color in each case. In fact, unless eggs are white or, at most, plain colored, family distinctions usually prevail, and this holds generally even in the *Oscines* where natural lines are faintly drawn. Of course this does not imply that the eggs of each family necessarily show any great similarity but rather that eggs selected from different families are usually sufficiently unlike to prevent confusion. Nevertheless, of the fifty (more or less) oscine families the two which, I presume, are the most clearly delimited are the *Alaudidae* and *Hirundinidae* and it happens that in each of these groups the eggs, as a whole, are very closely allied. Larks' eggs, while difficult to describe, conform to a type which is quite distinguishable, while all swallows' eggs seem to be white, some more or less flecked with brown. Further investigation of the various swallows' eggs illustrates one principle in oology which is fairly constant, namely, that eggs hidden in holes are apt to be white, or nearly so; *R. riparia*, *I. bicolor*, *T. thalassina* and *S. serripennis* are all hole-breeders. It is generally assumed that coloration is primarily a protective feature, and that it is lost, as useless, where eggs are completely hidden from view. Unfortunately there are also plenty of white eggs laid in open places: the eggs of both *Asio accipitrinus* and *S. cunicularia* are white just because they are *owls'* eggs, in all probability, irrespective of the fact that one bird exposes its eggs on the ground while the other burrows beneath it. At all events, the production and deposition of egg coloring matter must correspond to certain definite physiological, chemical and, perhaps, anatomical characteristics in one or both parents, and the fact that these causes may be apparently slight and inconsequential should not discourage our attempts to ascertain them; it is far easier to say they are "accidental", but more logical to assume that they follow some law if we can but find it. On the other hand, many efforts have been made to explain such coloration by the application of general principles affecting organic evolution as a whole, but the results of such broad speculations can hardly be expected to answer such minute requirements. In any event they are beyond the purview of this paper, but to the oologist who is sufficiently interested I would commend a perusal of Dixon's chapter on "Nidification" in Seebold's delightful "British Birds".

So much for this line of study, which the "comparative oologist" may amplify indefinitely. But other investigations lie invitingly at hand. Consider how little we know of the many unusual types of coloration which occasionally occur, departures from the mean which are sufficiently marked to be noteworthy and yet which do not fall within the category of "abnormalities", the latter offering a special field of its own which Jacobs at one time cultivated most successfully. In Europe collectors are particularly keen in the pursuit of "varieties", as these rarer types are called, and specimens have

fancy values accordingly. For instance, out of several hundred osprey eggs which have passed through my hands I have two sets in which the markings are all purple, and I recently received a set of Swamp Sparrow's eggs which the collector aptly termed "Pooecetes-like". Many (possibly all) species of *Corvus* occasionally lay eggs in which the customary green is replaced by red, though such instances are exceedingly rare. In just one species, as far as I am aware, this is the normal type and I have several sets of *Corvus capensis* from South Africa which closely resemble these peculiar eggs of our raven.

We have all run across nests which obviously contained eggs produced by more than one female; how often and among what species are such instances likely to occur? I do not think there is much data available, but special attention to this point would doubtless bring forth much hidden information. Many years ago I became sufficiently interested in this subject to record a few cases and, quite incidentally, coin a new word—co-nidification—which barely escaped immortalization in the Century Dictionary!\*

As I have already stated, the extension of a collection beyond the safe limits of the A. O. U. List is a difficult, expensive and altogether serious undertaking. It requires infinite time and patience to build up an exchange list, and for some entire regions this is quite impracticable. In Europe, the customs differ markedly from ours, data consists customarily of date and locality only and as dealers handle a very large percentage of the eggs it is a heartbreaking business to obtain really desirable material from the *original* sources. In South Africa and South America collectors are few and far between and oology has received scant attention in most localities. Australians, on the contrary, have every reason to be proud of their work along these lines. There are many active field oologists whose specimens and data compare favorably with our very best, and my personal acquaintance and extensive correspondence with them has been a real pleasure in every way. Of Indian oologists I know little and my collection is as yet practically barren in this rich field despite strenuous efforts at cultivation for several years. But in spite of the drawbacks, I must confess that the collector who once takes the plunge and becomes awake to the possibilities of exotic material is not likely to give up for lack of interest.

Thus, it is particularly fascinating if one is looking at oology from the comparative point of view, to fill the gaps which occur in most of our native groups. There are few families or even genera which are strictly North American and it is surprising to find what of the novel types fit in among our own familiar species. The following examples, which might be extended indefinitely, may serve to illustrate this point. The plain, light blue eggs of our own bluebirds (*Sialia*) form an interesting series, but the real home of their allies, the chats (*Saxicolinae*), is in the Palearctic region and eggs of the many species found there present an endless variety, most of the specimens being more or less spotted. Again, in looking over our cabinets we may observe between the true thrushes and the wheatears one or more sets of small, dark eggs which seem strangely isolated and out of place; for North America we have only one representative (*Cyanecula*) of the large and interesting sub-family (*Ruticillinae*) which includes not only the nightingales but also the real robins and redstarts after which our birds were long ago misnamed. Many of these eggs are particularly beautiful and among the various species there is great diver-

\*The late Professor Coues was then at work on the zoological section; having heard of the word he asked for the original reference—the old O. & O., I think—but I inadvertently neglected to inform him.

sity, from delicate pinks and blues to dark olive-browns. Among the *Turdinae* we find that eggs of the twenty or more North American forms all have as ground color some shade of green or blue, but this is not common to all the true thrushes; in *T. viscivorus* it varies greatly from gray or greenish gray to reddish-brown; eggs of *M. olivacea* from South Africa are similar while in one species only (*Oreocichla mollissima*) it is white.

Doubtless most of the facts and speculations set forth above are familiar to readers of THE CONDOR and, having little claim to originality, my only excuse in presenting them is an earnest belief that the time has come in this country when the study of egg collections as a whole should receive more attention and, particularly, that our collections should be so built up and expanded as to guarantee the most fruitful results.

*U. S. S. Washington, Puerto Plata, Santo Domingo, May 20, 1914.*